



U.S. ARMY SUSTAINABILITY



## Beyond An Inconvenient Truth:



The Army's March Toward  
Operationalizing Sustainability

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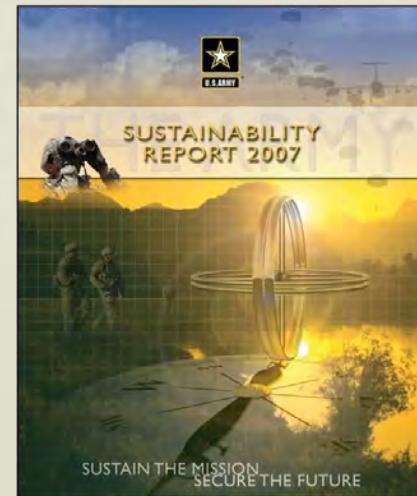
**U.S. ARMY SUSTAINABILITY**



# "U.S. Army Goes Green"

**"The United States Army might be fighting two wars in Iraq and Afghanistan, but that has not stopped the military behemoth from opening a third front against global warming. The progress it has made in that conflict is highlighted in the Army's first annual Sustainability Report released in September."**

*By GLOBE-Net Staff  
and as reported in New York Times Blog  
December 1, 2008*





## **U.S. ARMY SUSTAINABILITY**

**“We are now faced with the fact...that tomorrow is today. We are confronted with the fierce urgency of now.”**

Dr. Martin Luther King Jr., 1967



## "Planet Earth" – The Challenges

Life Supporting Resources

DECLINING

RISING

Consumption of life  
supporting resources

### Consequences:

- Mission Constraints
- Public Concerns
- Resource Scarcity
- Degradation of air, land and water
- Reduced well-being
- Competition for resources
- Threats to Security

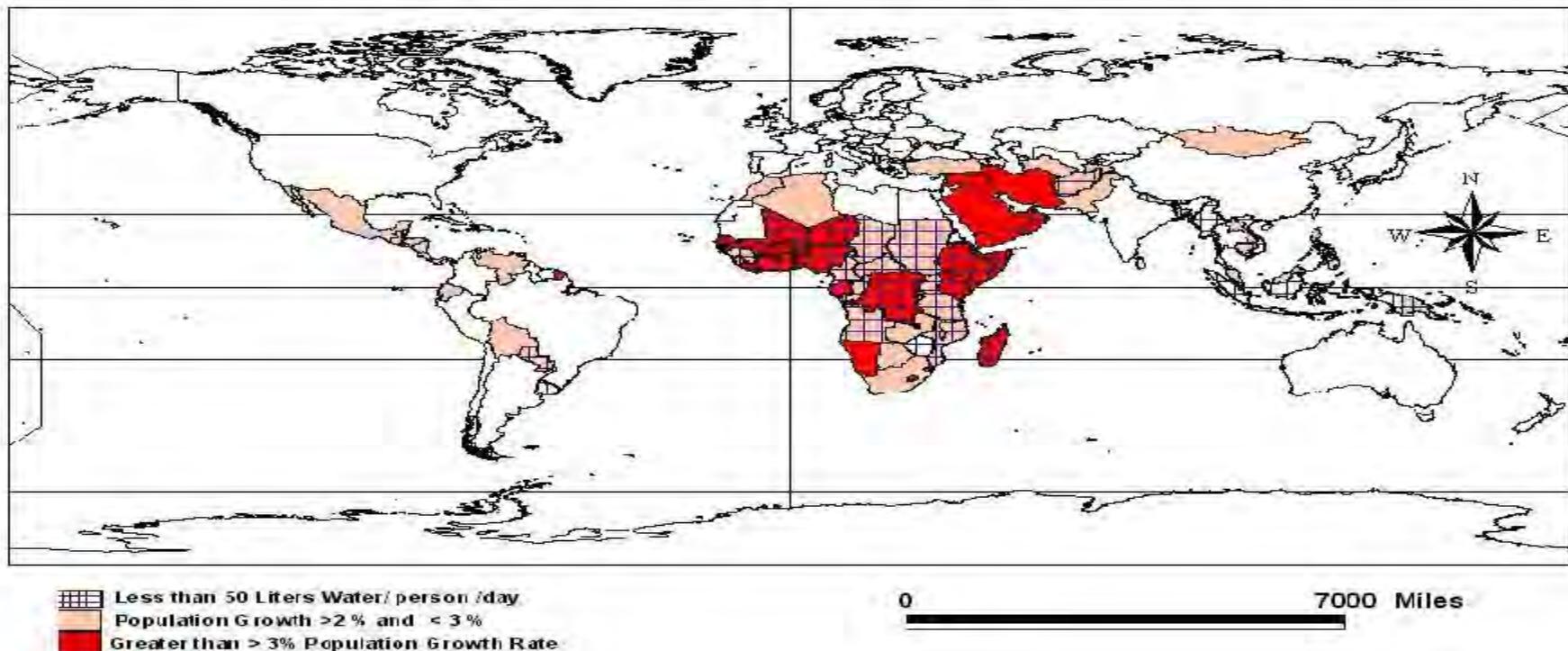
Sustain the Mission – Secure the Future



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# Water Scarcity Leading to Instability

FIGURE 4 - 4  
Correlation of Water Scarcity with Population Growth Rates



Source: BG (Ret) King, 2000, *Understanding International Environmental Security: A Strategic Military Perspective*, AEPI Report,



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# National Security Implications

**“Competition for water, resources, food is going to increase the international friction. Estimates are that energy supplies are not going to equal demand even if you count in what people are trying to do in the interim to increase it or look for alternative sources. Climate change [and] natural disasters create friction, create tensions and population movements and pandemics.”**

GEN George W Casey  
U.S. Army Chief of Staff



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# Army Sustainability

### Sustainability Defined

A sustainable Army simultaneously

- meets current as well as future mission requirements worldwide
- safeguards human health
- improves quality of life, and
- enhances the natural environment.

### The Army Strategy for the Environment



### Our Goals

- Foster a sustainability ethic
- Strengthen Army operations
- Meet test, training, and mission requirements
- Minimize impacts and total ownership costs
- Enhance Well-being
- Drive Innovation

**"Triple bottom line" Plus –**  
**Mission Environment, Community + Economy**



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# Operationalized Definition

Army sustainability is the organizing principle that enables access to training, materiel, and services necessary to provide a trained and ready force required for current and future military missions.



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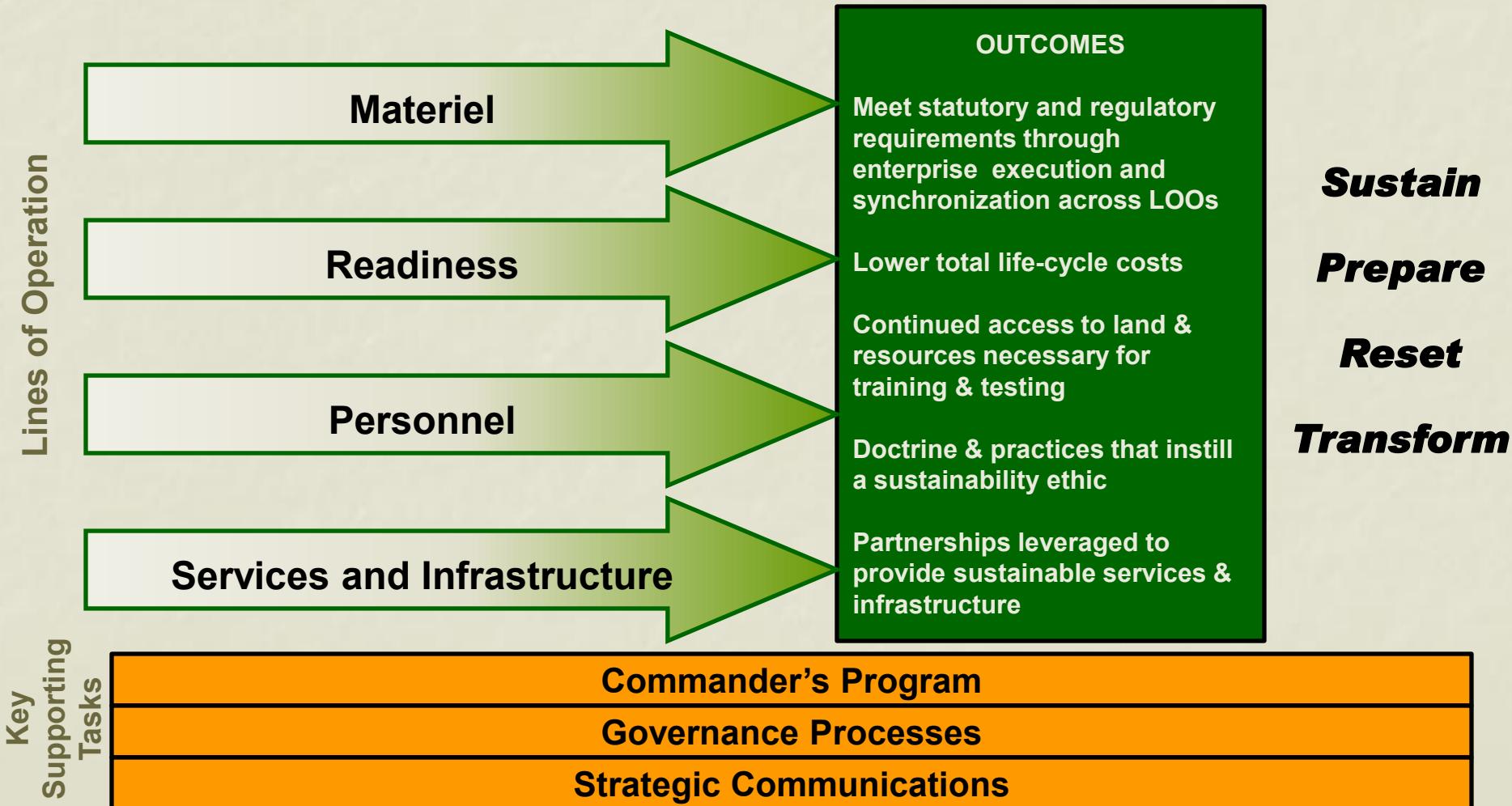
# Mission Statement

Incorporate sustainability into Army planning, training, equipping, and operations in order to enable future capabilities, lower life cycle costs, and conserve resources.

Employ Enterprise Approach: Empower senior leaders to take an holistic view of Army objectives and resources in order to act cohesively to effectively and efficiently generate trained and ready forces for Combatant Commanders and sustain the All-Volunteer Force.



# Concept of Operations – Operational Design

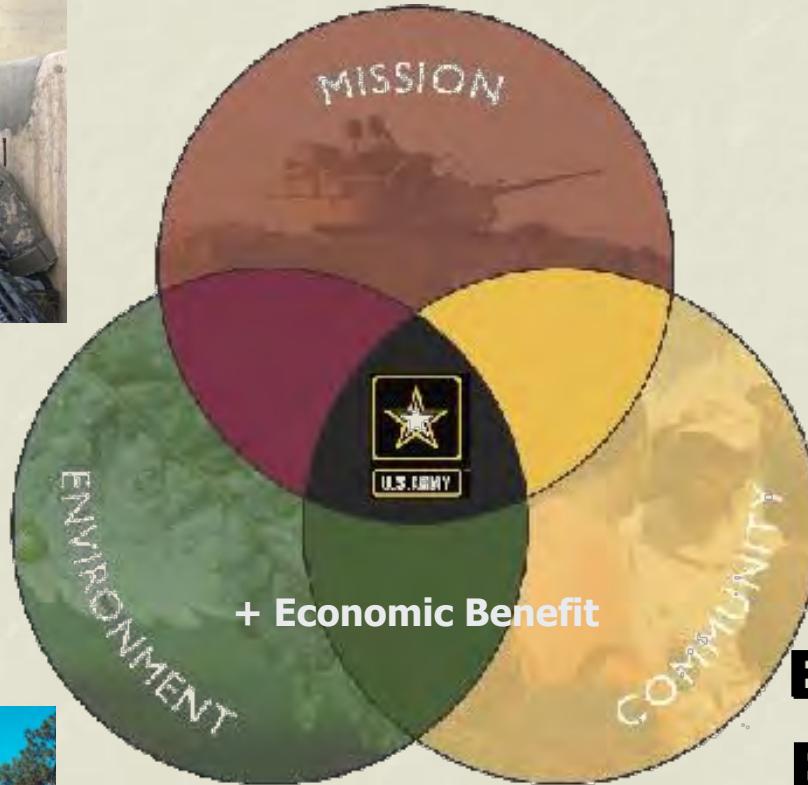




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# Triple Bottom Line - Plus



**The Army...  
Building Green,  
Buying Green,  
Going Green  
Army Green = Army Strong**



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# Building Green

- LEED Silver construction
- Zero Bootprint Camp
- Sustainable Training Areas



**Solar Power at Schofield Barracks, HI**



**Fort Carson LEED Gold 1 BCT HQ**



**Logistical Supply  
Area Anaconda  
Iraq**



# Buying Green

## ■ Army's Green Procurement

Guide. Preference for:

- Recovered Materials
- Biobased products
- Energy efficient products
- Non Ozone-depleting substances
- Environmentally preferred products



**Green Computers**



**Stryker System**



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# Going Green

- Integrated Hybrid Technology
- Alternative fuel vehicles
- Renewable Energy



**Army Neighborhood Electric Vehicle**



**Hybrid Electric Drive HMMWV**



**Army/GM Fuel Cell Pickup**



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# **Army Energy Security Mission**

**Mission:** Make energy a consideration in all Army activities in an effort to reduce demand, increase efficiency, seek alternative sources, and create a culture of energy accountability for all Soldiers.

**Vision:** Transform the Army's energy posture and culture to enhance and ensure mission success and quality of life for our Soldiers and their Families while serving as a model for the Nation.



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# Strategic Energy Security Goals

- Reduced energy consumption
- Increased energy efficiency across platforms and facilities
- Increased use of renewable/alternative energy
- Enhanced energy security
- Reduced adverse impacts on the environment



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# Renewable Energy Initiatives – The Present



**Camp Williams, UT**



**Fort Irwin Renewable Energy Projects**



**Rapid Equipping Force**



**Fort Knox Geothermal Well Field**



**Fort Carson photo-voltaic**



**Field tactical battery charging**



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# Renewable Energy Initiatives – The Future

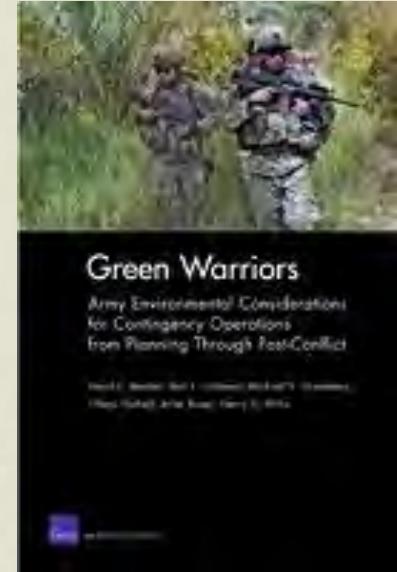
- Building metering – electric, natural gas, water, steam
- Biomass Waste-to-Liquid Fuel Technology Demonstration
- 30Mw Geothermal Power at Hawthorne Army Depot, NV
- Neighborhood Electric Vehicles – 4,000 across the Army
- Energy Savings Performance Contract at Fort Leavenworth, KS
- 500Mw Solar Energy at Fort Irwin, CA





# RAND Green Warrior Report

- Commanders, Staff and leaders must consider environmental impacts early and often
  - Protection of soldier health
  - Avoid costly clean-up after the fact
  - Save precious and costly resources
  - Minimize risk
- RAND researched Iraq, Afghanistan & Balkans
  - 111 Case Studies compiled
- Recommendations include
  - Updating policies and doctrine
  - Better incorporate environmental considerations in planning
  - Carefully select and manage contractors
  - Transmit lessons learned and ensure training occurs





# Tactical Electric Solar Systems - Assessment On-Going in Iraq -

Description:

- Solar power generator recharges batteries necessary to power computers, cameras, and other electronics in remote environments.
- Easy-to-use system requires minimal training to set-up and operate.
- Assessments on-going in Iraq to determine feasibility of using at remote sites.

Benefits/Metrics

- Soldier transportable renewable power generator can reduce battery disposal and fuel requirements in theater.
- Metric 1: Time to battery recharge





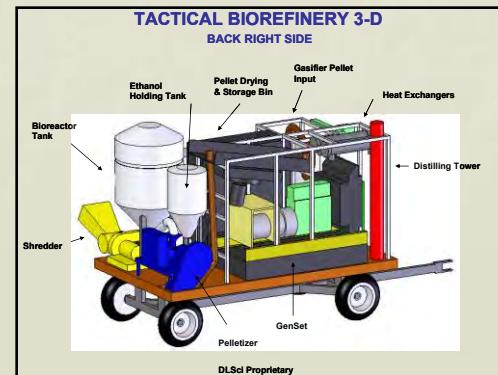
# Tactical Garbage to Energy Refinery

## Description:

- Tactical Garbage to Energy Refinery (TGER) converts field waste (paper, plastic, cardboard and food slop – no glass or metal) into biofuel gas that is used to power a 60kW generator.
- Sent to Camp Victory, Iraq for a 90-day field test

## Field Test Results:

- TGER consumed 9,513 lbs of mixed waste
- Consumed 6,882 lbs solid waste; 2,631 lbs liquid waste
- Test run results on 1 Aug 08 (example):
  - Total usable power – 48kW
  - TGER consumed 1.5 gal diesel/hr to produce 48kW of off-board power





# Transportable Hybrid Electric Power Station

## Description:

- Transportable 5kW Hybrid Power Station reduces the need for fossil fuels at remote operating locations.
- Tactical Operation Center (TOC) Variant enables small work space with virtually no fuel requirements
- Mobile Electric Power (MEP) Variant



## Benefits/Metrics

- Reduces Coalition risk by reducing external fuel requirements
- Metric 1: Gallons of Conventional Fuel required to power an Enduring Forward Operating Base/Facility
- Metric 2: \$/kWh of electricity at Enduring Forward Operating Base/Facility





# Water Vulnerability Study

## Study Objectives

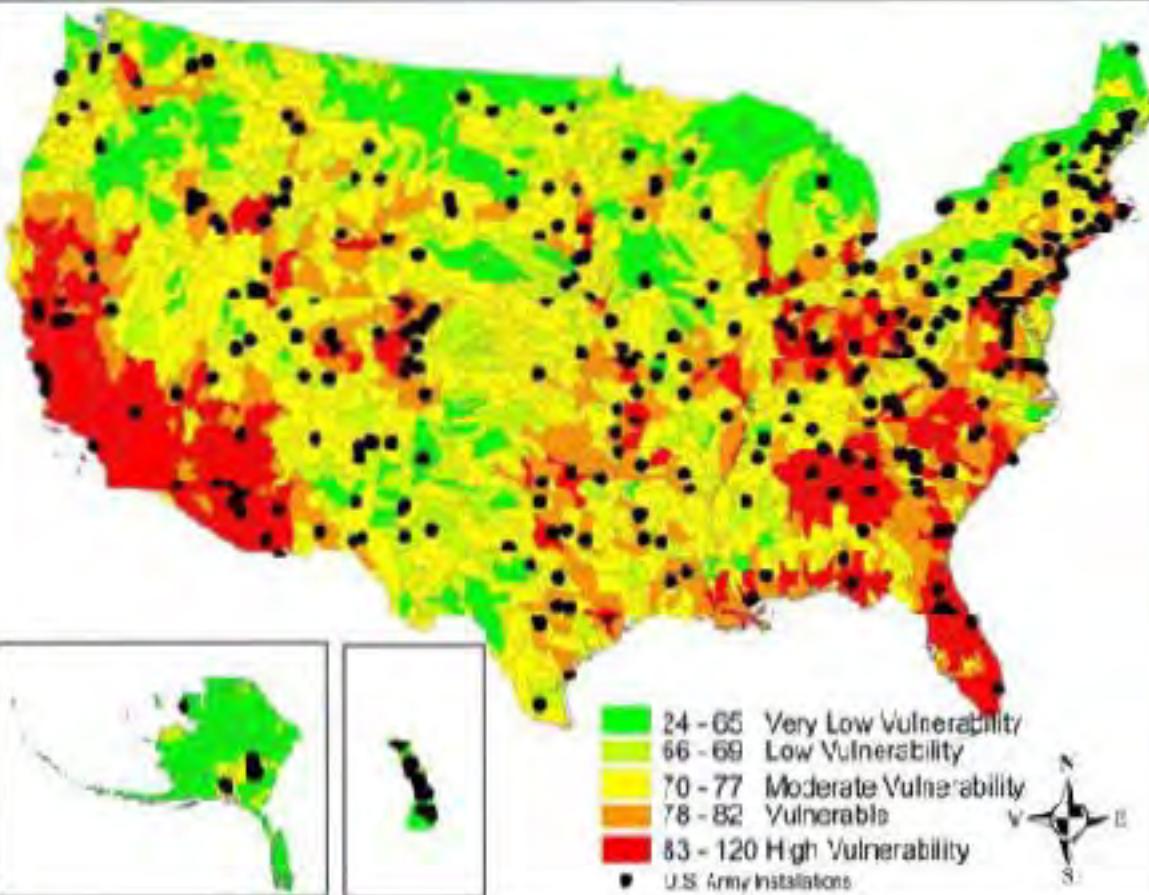
- Evaluate the vulnerability of Army installations to potential water shortages over the next 30 years.
- List installations by water vulnerability criteria, primary mission, and relative demand for water.
- Develop methodology and conduct detailed water evaluations at two installations.
- Identify policy options and technology advances to minimize potential impacts of water shortages on Army missions.





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### Watershed “Health”



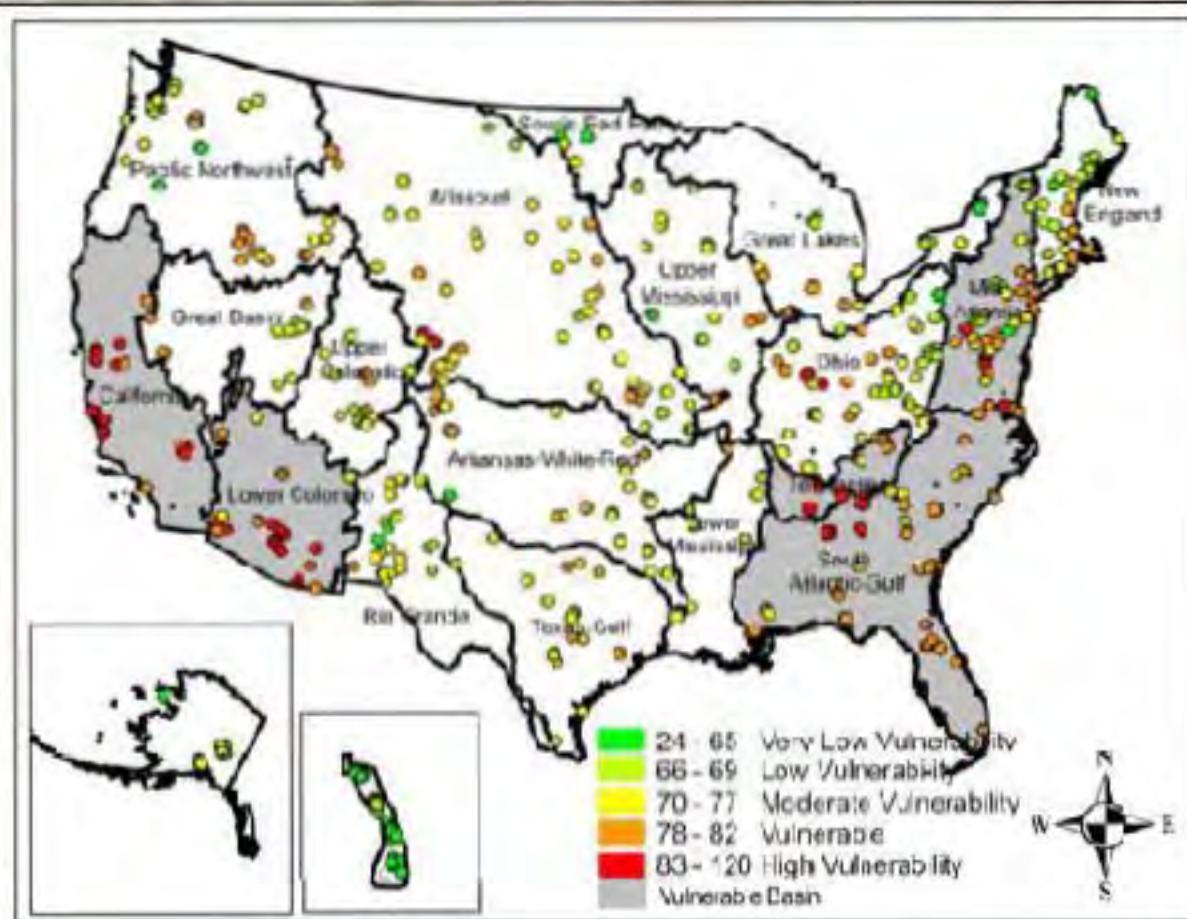
Identify  
watersheds  
with the most  
critical  
issues.

**RED**  
watersheds  
are those  
having the  
greatest need  
for correction,  
protection, or  
restoration.



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### Priority Watersheds/Basins

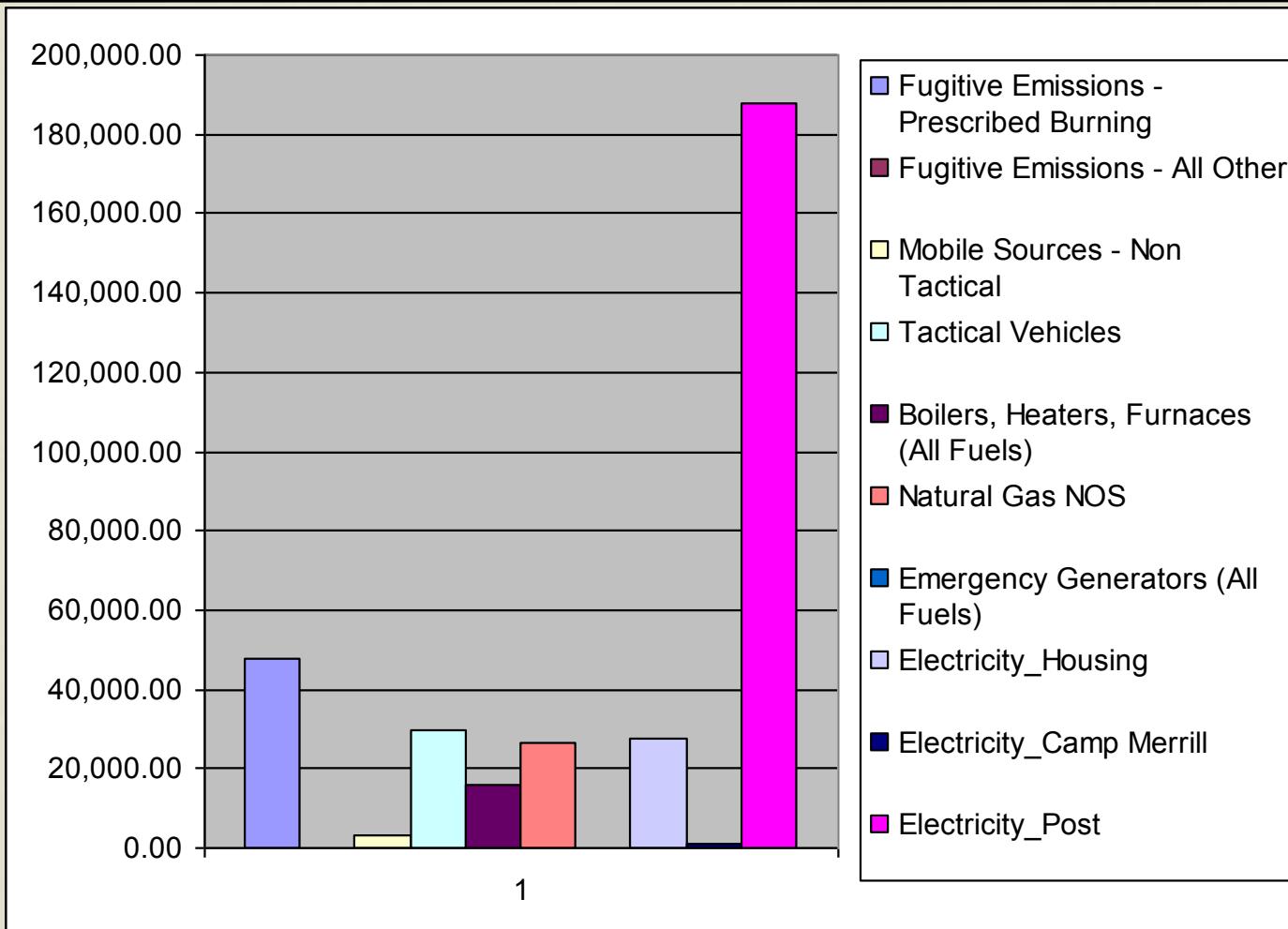


Associate watershed health score to Army installations.

GRAY highlights target basins/installations for more detailed study and water resource protection.



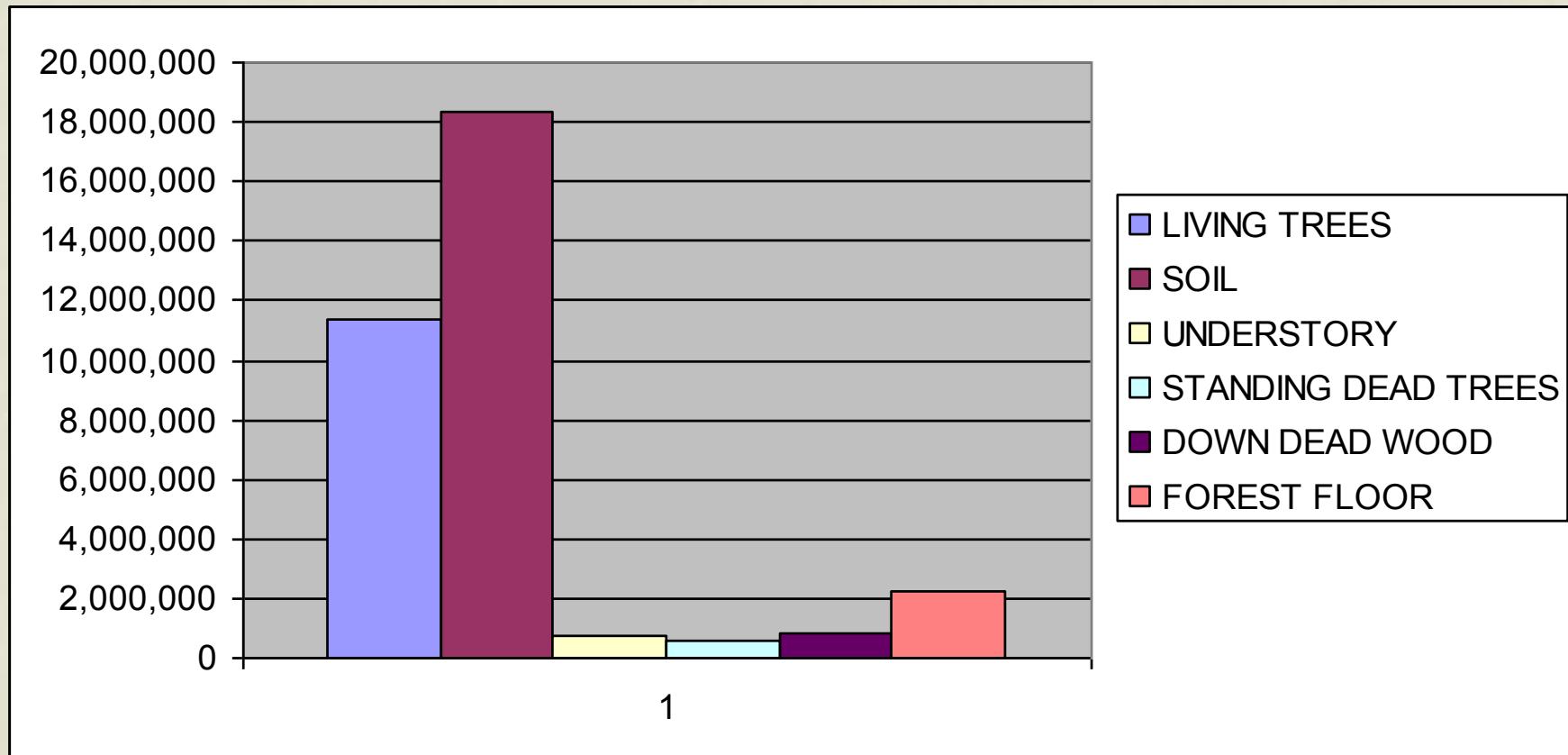
# Installation Greenhouse Gases Sample



GHG Emissions by Source Category (Metric Tons CO2-e)



# Installation Carbon Sequestration Sample

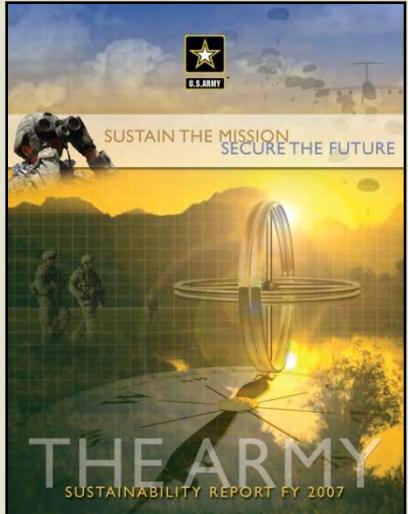


Sequestered Carbon (Metric Tons CO<sub>2</sub>)



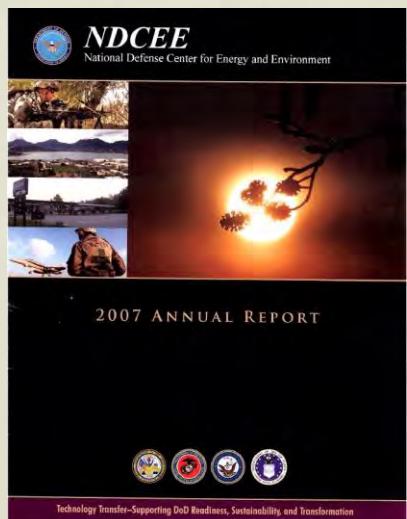
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# Moving Sustainability Forward



**2008 Army  
Sustainability  
Report**

**Army Strategy  
for the  
Environment**



**2008  
NDCEE  
Annual  
Report**

**Army  
Campaign  
Plan for  
Sustainability**

**CAMPAIGN PLAN  
FOR  
OPERATIONAL  
SUSTAINABILITY**





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# The Army... Our National Standard Bearer

“Pay attention: When the U.S. Army desegregated, the country really desegregated; when the Army goes green, the country could really go green.”

Thomas Friedman  
Pulitzer Prize Winner

Author of *Hot, Flat and Crowded: Why We Need a Green Revolution and How It Can Renew America*



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# Army Values





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**“We are now faced with the fact...that tomorrow is today. We are confronted with the fierce urgency of now.”**

Dr. Martin Luther King Jr., 1967



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# Beyond An Inconvenient Truth:



## The Army's March Toward Operationalizing Sustainability



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## Water Indicators

### ■ Supply

- Streamflow
- Local Water Production
- Presence of Groundwater
- Low Flow Sensitivity
- Groundwater Depletion
- Drought Sensitivity
- Federally Declared Disasters
- Seismic Zones
- Federally Declared Floods
- Flood Risk
- Species (TES) Richness
- Species (TES) Hotspot
- Air Quality Attainment Status
- Water Quality

### ■ Demand

- Total Withdrawals
- Per Capita Consumption
- Energy Production Withdrawal
- Population Density
- Population Growth
- Population Projections
- State Smart Growth Plans
- Proximity to MSA
- Proximity to Interstate
- Traffic Volume





## Army Green Chemistry Successes

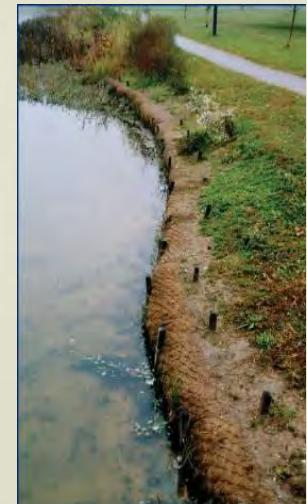
- Halon and ODS alternatives
- Cadmium, Chrome (VI) substitutes
- Perchlorate replacements
- Green munitions
  - M115A2 Artillery Simulator
  - M116A1 Hand Grenade Simulator
- HAP-Free/Low VOC paints and solvents
- Redwater-free TNT
- Energetic material “Virtual Laboratory”





## **Army Chesapeake Bay Program**

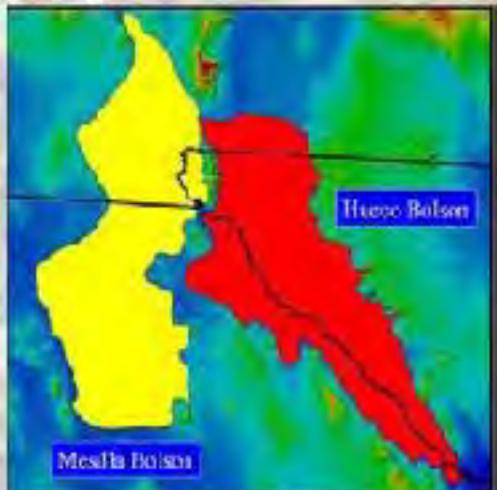
- 19 Army Installations; 310,000 Acres of Army Property
- Emerging Army Strategy:
  - Incorporate Low Impact Development projects
  - Contribute to restoring healthy waters and habitats
  - Support stewardship of Chesapeake Bay fisheries and watersheds
  - Nutrient Management Plans
  - Control invasive species





## Fort Bliss Region – Supply & Demand

- Current Sources
  - 50% Rio Grande
  - 25% Hueco Bolson
  - 15% Mesilla Bolson
- Potential Future Sources
  - West Texas Bolson (Wildhorse and Antelope)
  - Captain Reef
  - Bone Spring/Victoria Peak (Del City)
  - Expanded Water Reclamation



Source: El Paso Water Utilities (<http://www.epwu.org>)

El Paso Water Utilities

Year	2010	2020	2030	2040	2050	2060
Projected Supply	152,387	165,531	188,675	207,820	227,299	247,424
Projected Demand	138,900	164,072	187,675	207,820	227,299	246,108



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# EPA Top Five Priorities\*

- Reducing greenhouse gas emissions
- Improving air quality
- Managing chemical risks
- Cleaning up hazardous-waste sites
- Protecting America's water

\* As stated by Ms. Lisa Jackson, EPA Administrator, in memo to: All EPA Employees, 23 Jan 09



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# A Balanced Approach

Cleanup



Sustainability





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# Green Remediation



## Landfill Wastewater Recycling at Fort Sheridan

- Reduction of burden on watershed
- Eliminated need for trucking



### Soil Treatment at Camp Withycombe

- 270T T Lead Bullets Recycled
- 30,000 T Soil Remediated
- All Water Reclaimed for Irrigation





# Army Greenhouse Gas Study

Enable Army to continue the mission while reducing greenhouse gas (GHG) emissions

## Fort Carson Demonstration

- Scope 1 – track direct GHG emissions from sources within the boundary of Fort Carson
- Scope 2 – track indirect GHG emissions from purchased electricity, heat, or steam consumed at the Installation, but not generated by sources within the boundary of Fort Carson
- Scope 3 – track other indirect GHG emissions which are a consequence of Installation activities but are emitted from sources not owned or controlled by Fort Carson
- GHG Reduction Projects – permanent removal or offset of GHG emissions resulting from planned human activity



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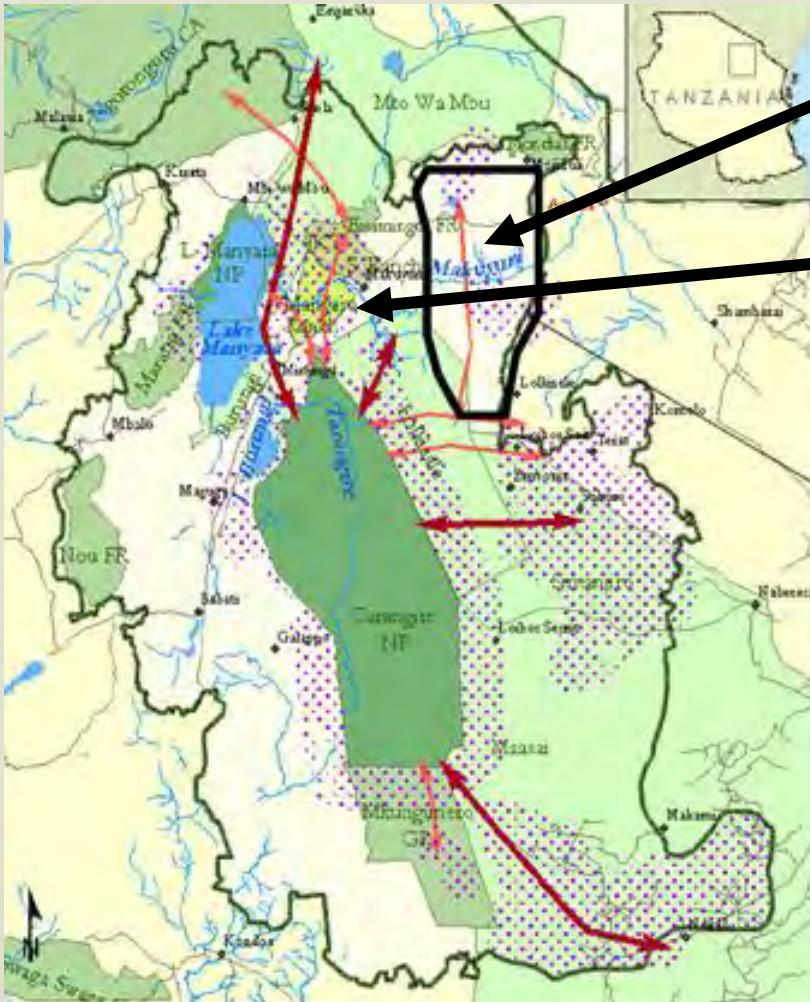
# United States Africa Command

- Tanzania
  - Sustainable Ranges
  - Wildlife Conservation
- Zambezi River Basin
  - Transportation
  - Water Resources Management
- Remnants of War
  - Humanitarian Demining
  - UXO Removal





# Conservation Case Study



Tanzanian Brigade 303  
Training Area (size of Ft.  
Hood)

AID/Nature Conservancy  
Joint Project Area

The case study highlights an opportunity to link a military engagement activity with an existing USG/NGO project at marginal cost

Animal Migration Paths	
	Low use paths
	High use paths



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# Regional Water Resources Case Study

The Zambezi River Basin demonstrates how the Army can contribute its technical expertise to support a major sustainable development effort with significant implications for several nations in the region.





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# **Explosive Remnants of War Case Study**

The case highlights using the basic core competencies of the military: de-mining, UXO disposal and munitions storage; to address the safety and sustainability of civil populations.



Mines kill healthy members of the community, creating a financial and social hardship while limiting agriculture.



**UXO in Guinea-Bissau**

Munitions storage issues undermine the legitimacy of the state and limit the effectiveness of the military to execute basic missions.

UXO pollute and threaten the safety of the community.



**Munitions Storage  
In Mozambique**



# Fully Burdened Cost of Fuel

- Sustain the Mission Project (SMP) Decision Support Tool
  - Calculates the *fully burdened costs of fuel and water* (FBCF/W) for missions in theaters of operation and training bases
  - Provides Army personnel a user-friendly, quick turnaround, consistent, and auditable capability
  - Uses existing Army and DOD sources of data; readily allows data updates *and "what if" analysis*
- Validated by Deputy Assistant Secretary of the Army-Cost and Economics
- Acknowledged for advances in FBCF analysis in the Defense Science Board Report on Energy Strategy and the GAO Report on mobility fuels
- Force Protection and Logistical Impacts----
  - Fuel savings,
  - reduction of Fuel/Water Supply Truck and Gun truck miles, Apache hours, and Ground Convoy Equivalents



## Final Thoughts

- The Army has **embraced Energy Conservation** and is enabling the application of numerous high-payoff efforts, to include:
  - **SPRAY FOAM INSULATION:** The Army has led the way with spray foam insulation, and has provided spray foaming application procedures and **lessons learned to the other services... and it's SAVING LIVES right now.**
  - **RENEWABLE ENERGY:** The Army is exploring numerous advanced, high tech systems and equipment to reduce the use of fossil fuels, reduce greenhouse gases and increase the use of alternative fuels.
  - **COST DETERMINATION:** Accurately measuring and understanding true costs associated with fuel delivery/distribution helps motivate energy conservation at every level
- Army leadership fully committed to all efforts associated with **lowering log footprint** without sacrificing soldier QOL or support to the warfighter

**Energy Conservation = Lower Fuel Rqmts =  
Trucks Off The Road = REDUCED RISKS**